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New Species of the Genus *Pheretima* s. lat. (Annelida, Oligochaeta,
Megascolecidae) from Tokyo, Japan—Part V.
Species with Simple Intestinal Caeca (3)

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Abstract In the fifth series of the study on the genus *Pheretima* s. lat. (family Megascolecidae) collected from Tokyo, a group of the species with simple intestinal caeca is dealt with and 8 new species are described here: *Pheretima mutabilis*, *Ph. nubicola*, *Ph. conformis*, *Ph. disticha*, *Ph. hinoharensis*, *Ph. umbrosa*, *Ph. invis*a, *Ph. monticola*.

Key words : Megascolecidae, *Pheretima* s. lat., New species, Tokyo.

Introduction

Forty seven undescribed species of the genus *Pheretima* s. lat. were found from Tokyo. Among them, 11 new species with manicate intestinal caeca were described in the first part (Ishizuka, 1999 a), 10 new species with serrate intestinal caeca in Part II (Ishizuka, 1999 b), 7 new species with simple intestinal caeca (1) in Part III (Ishizuka, 1999 c), and 11 new species with simple intestinal caeca (2) in Part IV (Ishizuka, 1999 d). In Part V, 8 new species of simple intestinal caeca (3) are described.

***Pheretima mutabilis* sp. nov.**

[New Japanese name: Heni-mimizu]
(Figs. 1–9, Table 1)

Description. Body. Length 80–110 mm, width 2.3–3.4 mm. Number of segments 95–115. Reddish brown dorsally, greyish white ventrally.

External characters. Four pairs of spermathecal pores situated in furrow 5/6/7/8/9, in ventro-lateral side, separated by a distance of ca. 1/3 body circumference. Genital markings, 1–3 paired, circular to oval sucker-shape; preclitellar slightly median to the line spermathecal presetal on segments VII–IX, pre- and postsetal, closely associated with the spermathecal pores, in furrows 5/6/7/8/9; postclitellar slightly median to the line of the male pores, presetal on segments XVII–XX, variable in the number and situation. Male pores simple, on medium-sized porophores, superficial on segment XVIII, separated by a distance of ca. 1/3 body circumference.

Female pore single, mid-ventrally on segment XIV. First dorsal pore beginning in furrow 12/13. Clitellum including segments XIV–XVI. Setal number 25–33 in segment VII, 33–37 in segment XX.

Internal characters. Simple intestinal caeca, paired, originating in segment XXVII, extending anteriorly for 3–4 segments. Intestine begins in XVI. Genital glands paired, glandular masses in segments VI–IX and XVII–XX, associated with genital markings restricted to body wall, variable in the number and situation. Septa absent in 8/9/10, thickened in 5/6/7/8, slightly thickened in 10/11/12/13/14. Four pair of spermathecae, in segments VI–IX; ampulla consisting of a shovel-shaped pouch and a thick ducts; diverticulum consisting of a large oval pouch and a long duct. Seminal vesicles extending to the dorsal line in segments XI–XII. Prostata large, extending through segments XVI–XIX, ducts associated with the male pores.

Material examined. Holotype (NSMT-An 314) and 4 paratypes (NSMT-An 315): Mt. Takao, 15–IX–1985, K. Ishizuka, from soil under a mixed forest of evergreen and deciduous trees. Other specimens examined: 2 exs. with same data as the type series,

Remarks. The new species resembles *Pheretima fuscata* (Goto et Hatai, 1898), but is distinguishable from the latter species by the paired, genital markings, pre- and postsetal 5/6/7/8/9, presetal on XVII–XX.

***Pheretima nubicola* sp. nov.**

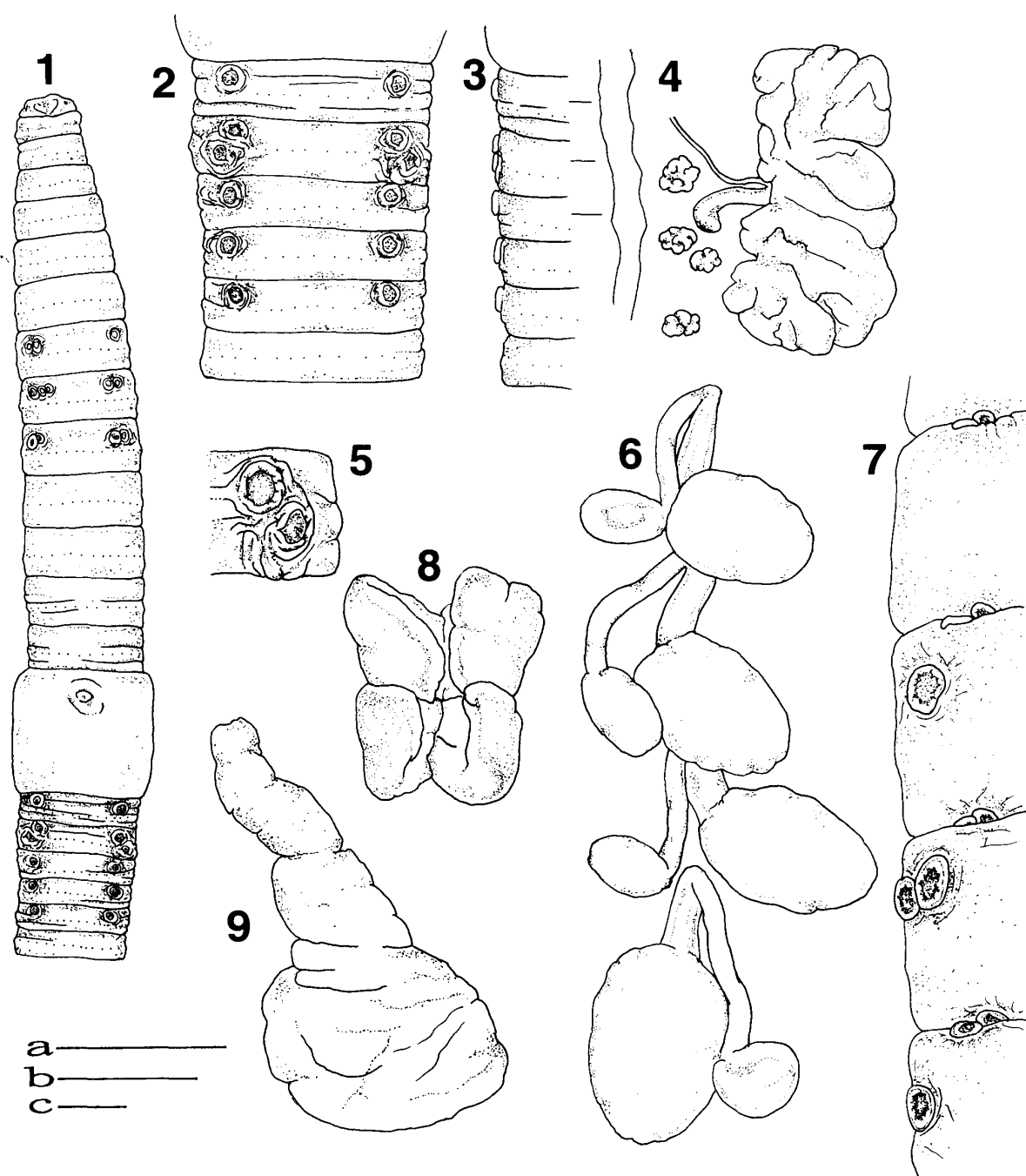
[New Japanese name: Miyama-mimizu]

(Figs. 10–18, Table 1)

Description. Body. Length 70–130 mm, width 2.5–4.0 mm. Number of segments 72–115. Reddish brown dorsally, greyish white ventrally.

External characters. Four pairs of spermathecal pores situated in furrow 5/6/7/8/9, in ventro-lateral side, separated by a distance of ca. 1/3 body circumference. Genital markings, paired, circular to oval sucker-shape; preclitellar in line with the spermathecal pores, post-setal on segments V–VIII, closely associated with the spermathecal pores, pre- and postsetal, in furrow 5/6/7/8/9; postclitellar slightly median to the male pores, presetal on segments XVII–XVIII and occasionally XIX–XX, variable in the number and situation. Male pores simple, on medium-sized porophores, superficial on segment XVIII, separated by a distance of ca. 1/3 body circumference. Female pore single, mid-ventrally on segment XIV. First dorsal pore beginning in furrow 11/12. Clitellum including segments XIV–XVI. Setal number 28–32 in segment VII, 34–38 in segment XX.

Internal characters. Simple intestinal caeca, paired, originating in segment XXVII, extending anteriorly for 3–5 segments. Intestine begins in XV. Genital glands paired, glandular masses, in segments V–VIII and XVII–XVIII, associated with genital markings restricted to body wall. Septa absent in 8/9/10, thickened in 5/6/7/8,



Figs. 1–9. *Pheretima mutabilis* sp. nov. Holotype (NSMT-An 314). 1: Ventral view of anterior body. 2, 4: Male pores and genital markings on segments XVII–XX and XXI. 3: Lateral view of segments XVII–XX and XXI. 4: Prostate gland with a duct and genital glands (glandular masses.) 5: Male pores and genital markings on segment XVIII. 6: Spermathecae. 7: Lateral view of segments VII–X. 8: Intestinal caecum. 9: Dorsal view of seminal vesicles. (Scale bars. a: 5 mm for 1, b: 1 mm for 5–8, c: 1 mm for 2–4, 9.)

slightly thickened in 10/11/12/13/14. Four pair of spermathecae in segments VI–IX; ampulla consisting of a shovel-shaped pouch and a thick duct; diverticulum consisting of a oval pouch and a long duct. Seminal vesicles extending to the dorsal line in segments XI–XII. Prostata large, extending through segments XVII–XIX, ducts associated with the male pores.

Material examined. Holotype (NSMT-An 316) and 4 paratypes (NSMT-An 317): Mt. Kumotori, 8–IX–1982, K. Ishizuka, from soil under a mixed forest of evergreen and deciduous trees. Other specimens examined: 1 ex. with same data as the type series, 6 exs. Nippara Valley, 5–VIII–1982. All the specimens were collected by the authors.

Remarks. The new species resembles *Pheretima kamakurensis* (Goto et Hatai, 1898) but is distinguishable from the latter species by the paired genital markings, pre- and postsetal 5/6/7/8/9, presetal on segments XVII–XVIII.

***Pheretima conformis* sp. nov.**

[New Japanese name: Ohdama-mimizu]

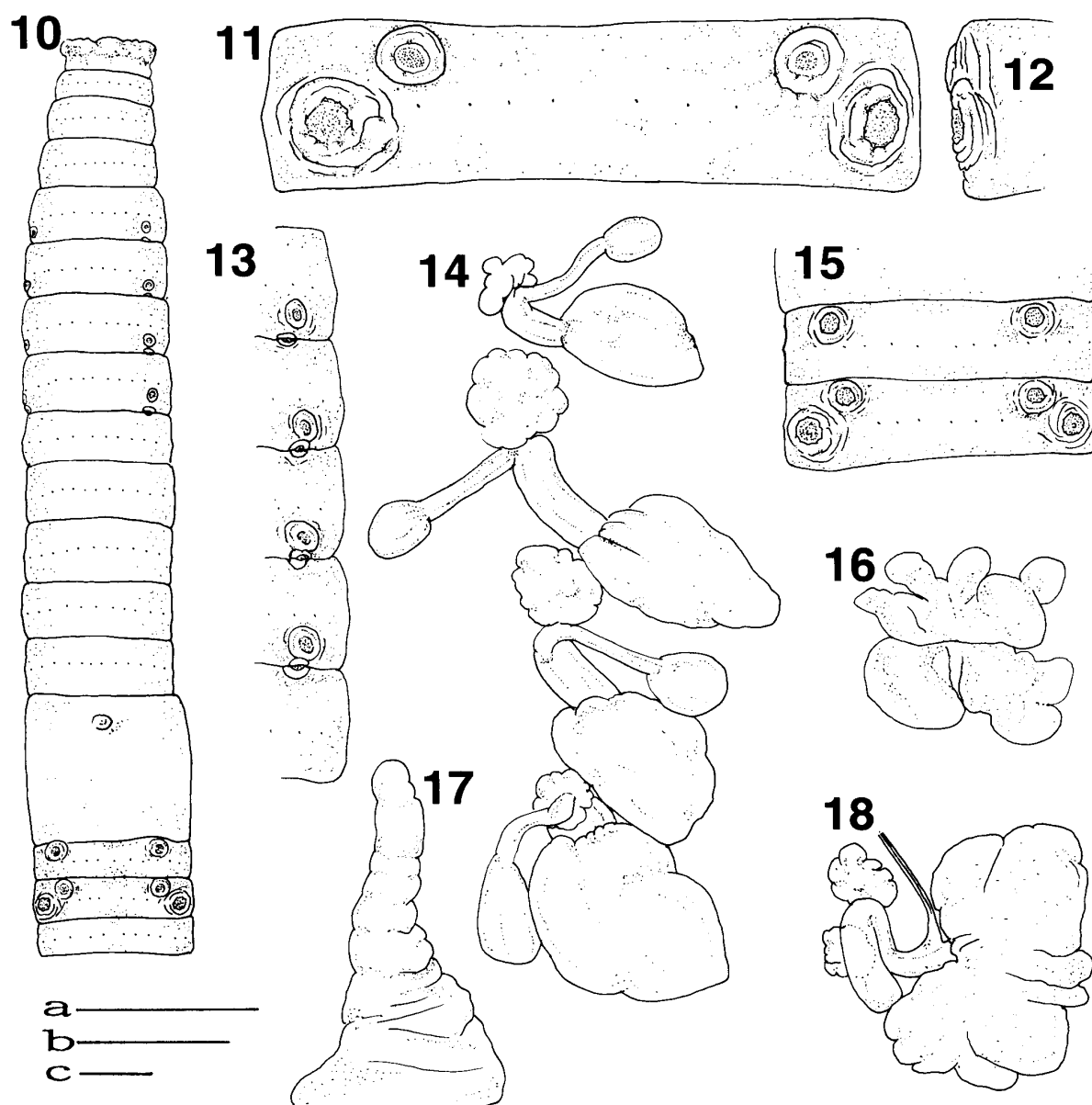
(Figs. 19–27)

Description. Body. Length 70–130 mm, width 3.0–3.6 mm. Number of segments 78–115. Reddish violet brown dorsally, greyish white ventrally.

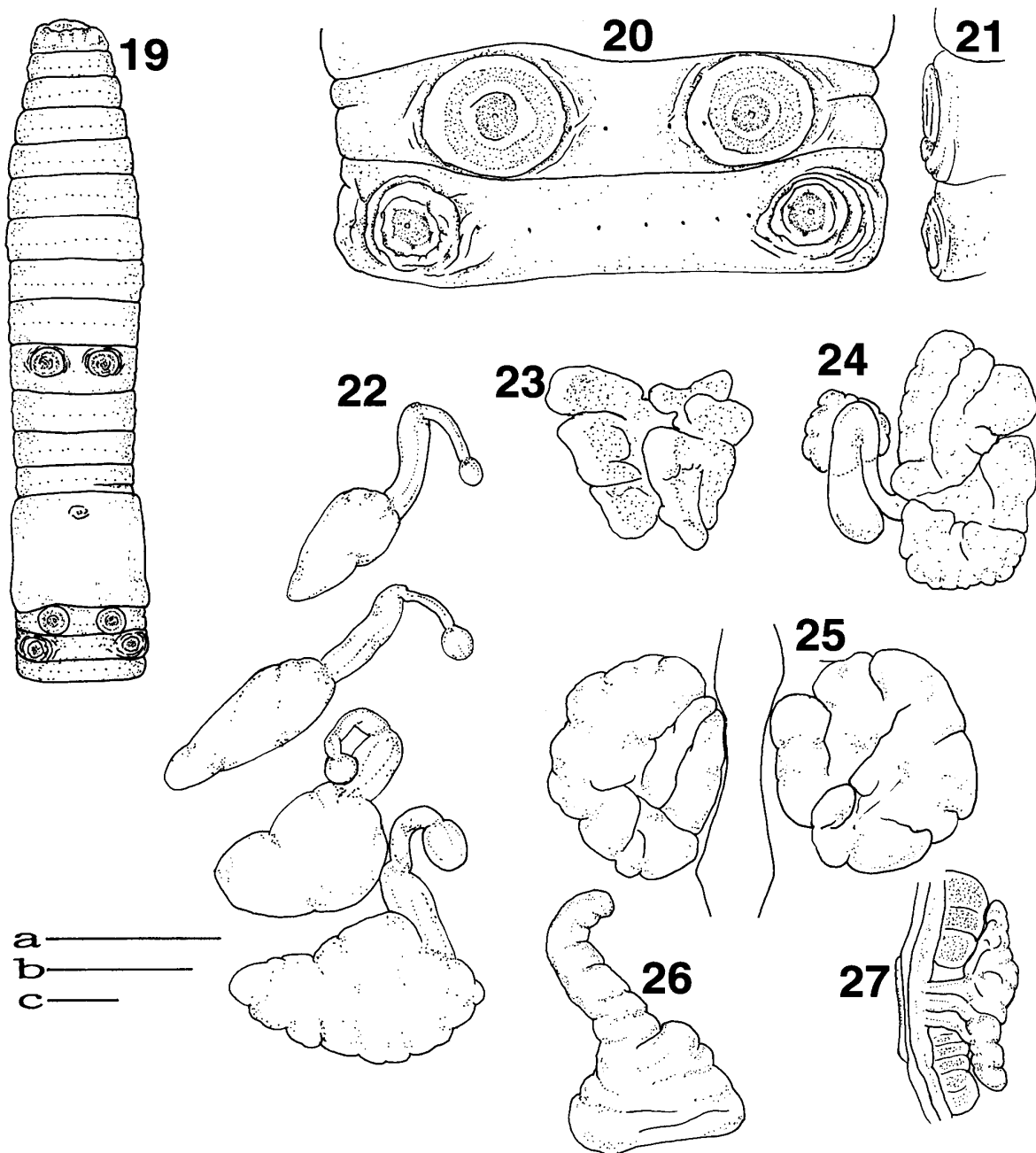
External characters. Four pairs of spermathecal pores situated in furrows 5/6/7/8/9, in ventro-lateral sides, separated by a distance of ca. 1/3 body circumference. Genital markings very large, paired, circular sucker-shape; postclitellar median to the line of the male pores, presetal on segment XVII and occasionally XVI and XVIII. External markings very large, paired, circular sucker-shape; preclitellar median to the line of the spermathecal pores, presetal on segment X and occasionally VII–IX and XI. Genital markings and external markings of the same size and form. Male pore large, simple, superficial on segment XVIII, separated by a distance of ca. 1/3 body circumference. Female pore single, mid-ventrally on segment XIV. First dorsal pore beginning in furrow 11/12. Setal number 24–30 in segment VII, 30–40 in segment XX.

Internal characters. Simple intestinal caeca, paired, originating in segment XXVII, extending anteriorly for 3–5 segments. Intestine begins in XV. Genital gland large, paired, glandular masses, on segment XVI, associated with genital markings restricted to body wall. Septa absent in 8/9/10, thickened in 5/6/7/8 and 10/11/12/13/14. Four pairs of spermathecae on segments VI–IX; ampulla consisting of a shovel-shaped pouch and a thick ducts; diverticulum consisting of a oval pouch and a short duct. Seminal vesicles, extending to the dorsal line in segments XI–XII. Prostata extending segments XV–XX, ducts associated with the male pore.

Material examined. Holotype (NSMT-An 318) and 5 paratypes (NSMT-An 319): Mt. Mitake, 27–VII–1980, K. Ishizuka, from soil under a mixed forest of ever-



Figs. 10–18. *Pheretima nubicola* sp. nov. Holotype (NSMT-An 316). 10: Ventral view of anterior body. 11: Male pores and genital markings on segment XVIII. 12: Latetral view of segment XVIII. 13: Latetral view of segments V–IX. 14: Spermathecae. 15: Male pores and genital markings on segments XVII–XIX. 16: Dorsal view of seminal vesicles. 17: Intestinal caecum. 18: Prostate gland with a duct and glandular masses. (Scale bars. a: 5 mm for 10, b: 1 mm for 11–12, 14, c: 1 mm for 13, 15–18.)



Figs. 19–27. *Pheretima conformis* sp. nov. Holotype (NSMT-An 318). 19: Ventral view of anterior body. 20: Male pores and genital markings on segments XVII–XIX. 21: Lateral view of segments XVII–XIX. 22: Spermathecae. 23: Dorsal view of seminal vesicles. 24: Prostate gland with a duct and glandular masses. 25: glandular masses. 26: Intestinal caecum. 27: a cross-sectional view of glandular mass. (Scale bars. a: 5 mm for 19, b: 1 mm for 20–22, 25, 27, c: 1 mm for 23–24, 26.)

green and deciduous trees. Other specimens examined: 1 ex. with same data as the type series. 12 exs. Mt. Nanatsuishi, 9–VIII–1985. 9 exs. Mt. Mitake, 21–VIII–1985. 6 exs. Ohtanba Valley, 30–VIII–1985. 1 ex. Mizune Valley, All the specimens were collected by the authors.

Remarks. The new species resembles *Pheretima brevicingula* Chen, 1938, but is distinguishable from the latter species by (1) four pair of spermathecal pores, and (2) the paired genital markings, presetal on segment X, setal on segment XVII.

***Pheretima disticha* sp. nov.**

[New Japanese name: Niretsu-mimizu]

(Figs. 28–34)

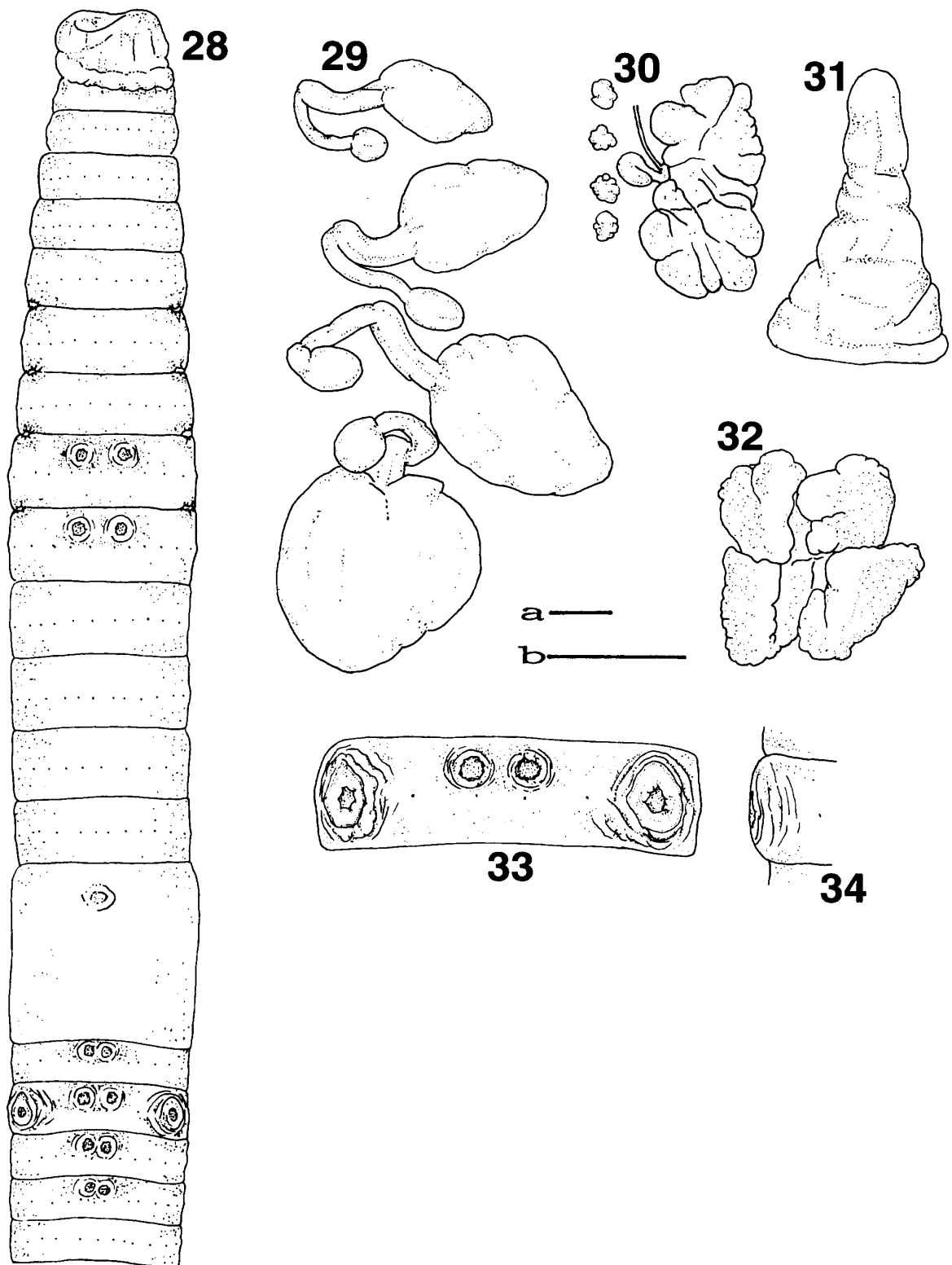
Description. Body. Length 40–70 mm, width 2.5–3.5 mm. Number of segments 75–96. Light brown dorsally, with light yellowish grey ventrally.

External characters. Four pairs of spermathecal pores situated in furrows 5/6/7/8/9 in ventro-lateral sides separated by a distance of ca. 1/3 body circumference. Genital markings, paired, circular sucker-shape; preclitellar close to the median line, presetal on segments VIII–IX, and occasionally VII, and X; postclitellar close to the median line, presetal on segments XVII–XX and occasionally XXI, XXII. Male pores large, simple, on medium-sized porophores, superficial on segment XVIII, separated by a distance of ca. 1/3 body circumference. Female pore single, mid-ventrally on segment XIV. First dorsal pore beginning in furrow 12/13. Clitellum including segments XIV–XVI. Setal number 28–32 in segment VII, 30–36 in segment XX.

Internal characters. Simple intestinal caeca, paired, originating in segment XXVII, extending anteriorly for 3–4 segments. Intestine begins in XV. Genital glands, paired, glandular masses, in segments VIII–IX and XVII–XX, associated with genital markings restricted to body wall. Septa absent in 8/9/10, thickened in 5/6/7/8, slightly thickened in 10/11/12/13/14. Spermathecae four pairs in segments VI–IX; ampulla consisting of a shovel-shaped pouch and a thick duct; diverticulum consisting of a oval pouch and a short duct. Seminal vesicles large, extending in segments XI–XII. Prostata large, extending through segments XVI–XIX or XVI–XX, corresponding to male pores.

Material examined. Holotype (NSMT-An 320) and 5 paratypes (NSMT-An 321): Mt. Mitake, 27–VIII 1980, K. Ishizuka, from soil under a mixed forest of evergreen and deciduous trees. Other specimens examined: 7 exs. with same data as the type series. 13 exs. Mt. Mitake, 21–IX–1985. 8 exs. Ohtanba Valley, 30–VIII–1983. All the specimens were collected by the authors.

Remarks. The new species resembles *Pheretima hexita* Chen, 1946, but is distinguishable from the latter species by (1) simple intestinal caeca, (2) four pair of spermathecal pores, and (3) the paired genital markings, presetal on segments XVII–XX.



Figs. 28–34. *Pheretima disticha* sp. nov. Holotype (NSMT-An 320). 28: Ventral view of anterior body. 29: Spermathecae. 30: Prostate gland with a duct and glandular masses. 31: Intestinal caecum. 32: Dorsal view of seminal vesicles. 33: Male pores and genital markings on segment XVIII. 34: Lateral view on segment XVIII. (Scale bars. a; 1 mm for 28, b; 1 mm for 29–34.)

***Pheretima hinoharensis* sp. nov.**

[New Japanese name: Hinohara-mimizu]

(Figs. 35–42, Table 1)

Description. Body. Length 60–85 mm, width 2.0–2.9 mm. Number of segments 80–100. Light brown dorsally, light yellowish grey ventrally.

External characters. Four pairs of spermathecal pores situated in furrows 5/6/7/8/9, in ventro-lateral sides, separated by a distance of ca. 1/3 body circumference. Genital markings, paired, circular sucker-shape; preclitellar closely associated with the spermathecal pores, postsetal on segments V–VIII; postclitellar slightly median to the line of the male pores, presetal on segments XVIII–XIX. Male pore simple, on medium-sized porophores, superficial on segment XVIII, separated by a distance of ca. 1/3 body circumference. Female pore single, mid-ventrally on segment XIV. First dorsal pore beginning in furrow 11/12. Setal number 28–34 in segment VII, 34–42 in segment XX.

Internal characters. Simple intestinal caeca, paired, originating in segment XXVII, extending anteriorly for 4–5 segments. Intestine begins in XV. Genital glands, paired, glandular masses, in segments VI–IX and XVIII–XIX, associated with genital markings restricted to body wall. Septa absent in 8/9/10, thickened in 5/6/7/8 slightly thickened in 10/11/12/13/14. Four pairs of spermathecae, in segments VII–IX; ampulla consisting of a shovel-shaped pouch and a short thick duct; diverticulum consisting of a oval pouch and a duct. Seminal vesicle extending in segments XI–XII. Prostata extending through segments XVII–XX, ducts corresponding to the male pore.

Material examined. Holotype (NSMT-322) and 3 paratypes (NSMT-323): Henpori (Itsukaichi City), 24–VII–1985, K. Ishizuka, from soil under a mixed forest of evergreen and deciduous trees. Other specimens examined: 1 ex. with same data as the type series. 4 exs. Minedani, 27–IX–1985. All the specimens were collected by the authors.

Remarks. The new species resembles *Pheretima fuscata* (Goto et Hatai, 1898), but is distinguishable from the latter species by the paired genital markings, closely associated with the spermathecal pores, presetal on segments XVIII–XIX.

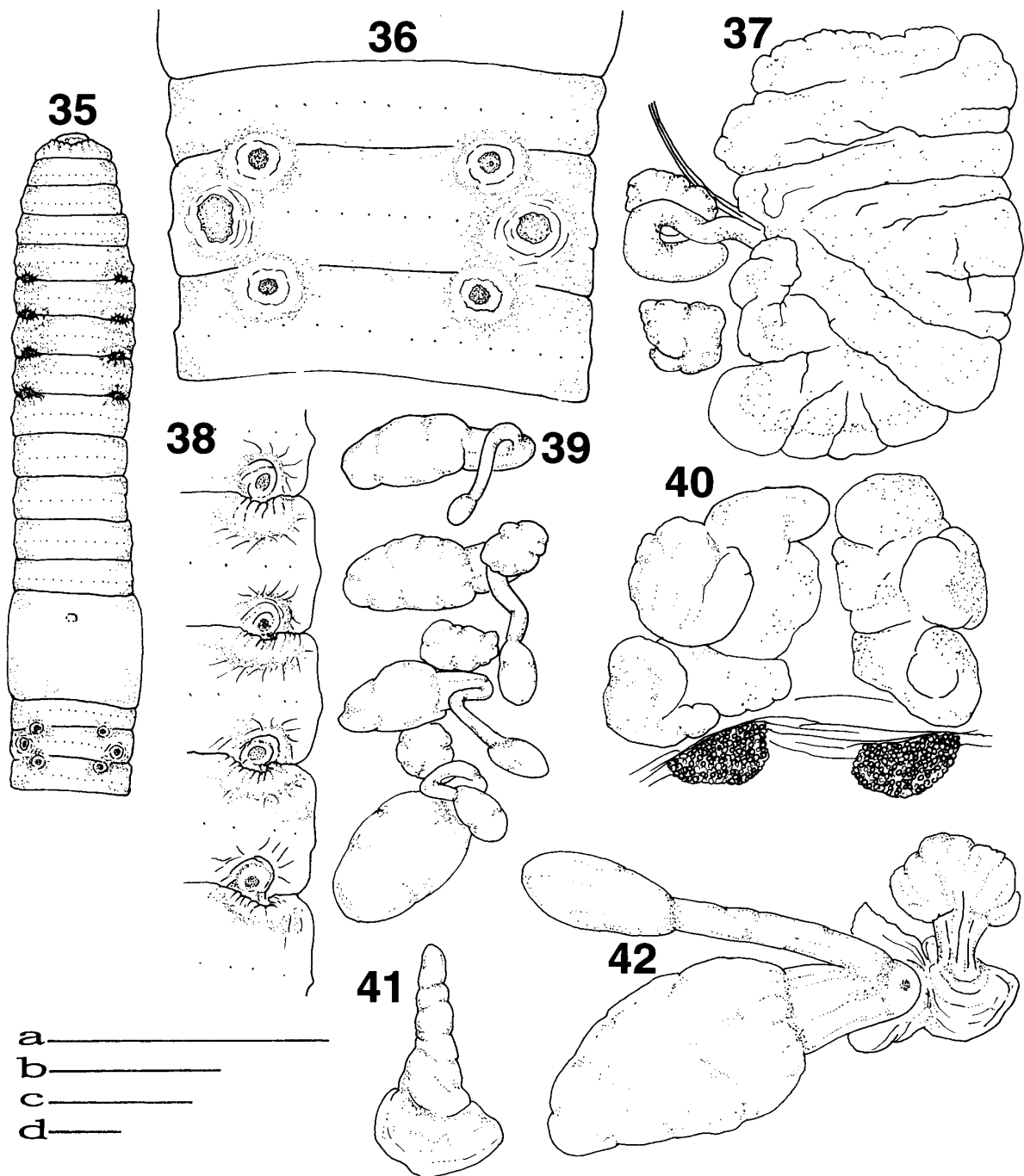
***Pheretima umbrosa* sp. nov.**

[New Japanese name: Hikage-mimizu]

(Figs. 43–51, Table 1)

Description. Body. Length 80–105 mm, width 3.5–4.0 mm. Number of segments 80–120. Light brown dorsally, greyish white ventrally.

External characters. Four pairs of spermathecal pores situated in furrows 5/6/7/8/9 in ventro-lateral sides, separated by a distance of ca. 1/3 body circumfer-



Figs. 35–42. *Pheretima hinoharensis* sp. nov. Holotype (NSMT-An 322). 35: Ventral view of anterior body. 36: Male pores on segment XVIII and genital markings on segments XIX–XX. 37: Prostate gland and glandular masses. 38: Latetal view of segments V–VII and IX. 39, 42: Spermathecae and glandular masses. 40: Dorsal view of seminal vesicles and ovary. 41: Intestinal caecum. (Scale bars. a: 1 mm for 42, b: 1 mm for 35, c: 1 mm for 36–40, d: 1 mm for 41.)

ence. Genital markings, 1–3 paired, circular sucker-shape; preclitellar median to the line spermathecal pores, preseatal on segments VI–IX, variable in the number and situation; postclitellar median to the line of the male pores, presetal on segments XVII–XIX. Male pores simple, on medium-sized porophores, superficial on segment XVIII, separated by a distance of ca. $1/3$ body circumference. Female pore single, mid-ventrally on segment XIV. First dorsal pore beginning in furrow 11/12. Clitellum including segments XIV–XVI. Setal number 32 in segment VII, 40 in segment XX.

Internal characters. Simple intestinal caeca, paired, originating in segment XVII, extending anteriorly for 2–3 segments. Intestine begins in XV or XVI. Genital glands, 1–3 paired, glandular masses, on segments VI–IX and XVII–XIX, associated with genital markings restricted to body wall. Septa absent in 8/9/10, thickened in 5/6/7/8 and in 10/11/12/13/14. Four pairs of spermathecae, very small, in segments VI–IX; ampulla consisting of a shovel-shaped pouch and a thick duct; diverticulum consisting of a oval pouch and a short duct. Seminal vesicles small, extending to the dorsal line in segments XI–XII. Prostata small, extending through segments XVIII–XIX or XVII–XIX, ducts corresponding to male pores.

Material examined. Holotype (NSMT-An 324) and paratype (NSMT-An 325): Ohtanba Valley, 18–X–1986, K. Ishizuka, from soil under a grassy place. Other specimens examined: 1 ex. with same data as the type series.

Remarks. The new species resembles *Pheretima divergens* (Michaelsen, 1892), but is distinguishable from the latter species by (1) simple intestinal caeca, and (2) light brown dorsal color.

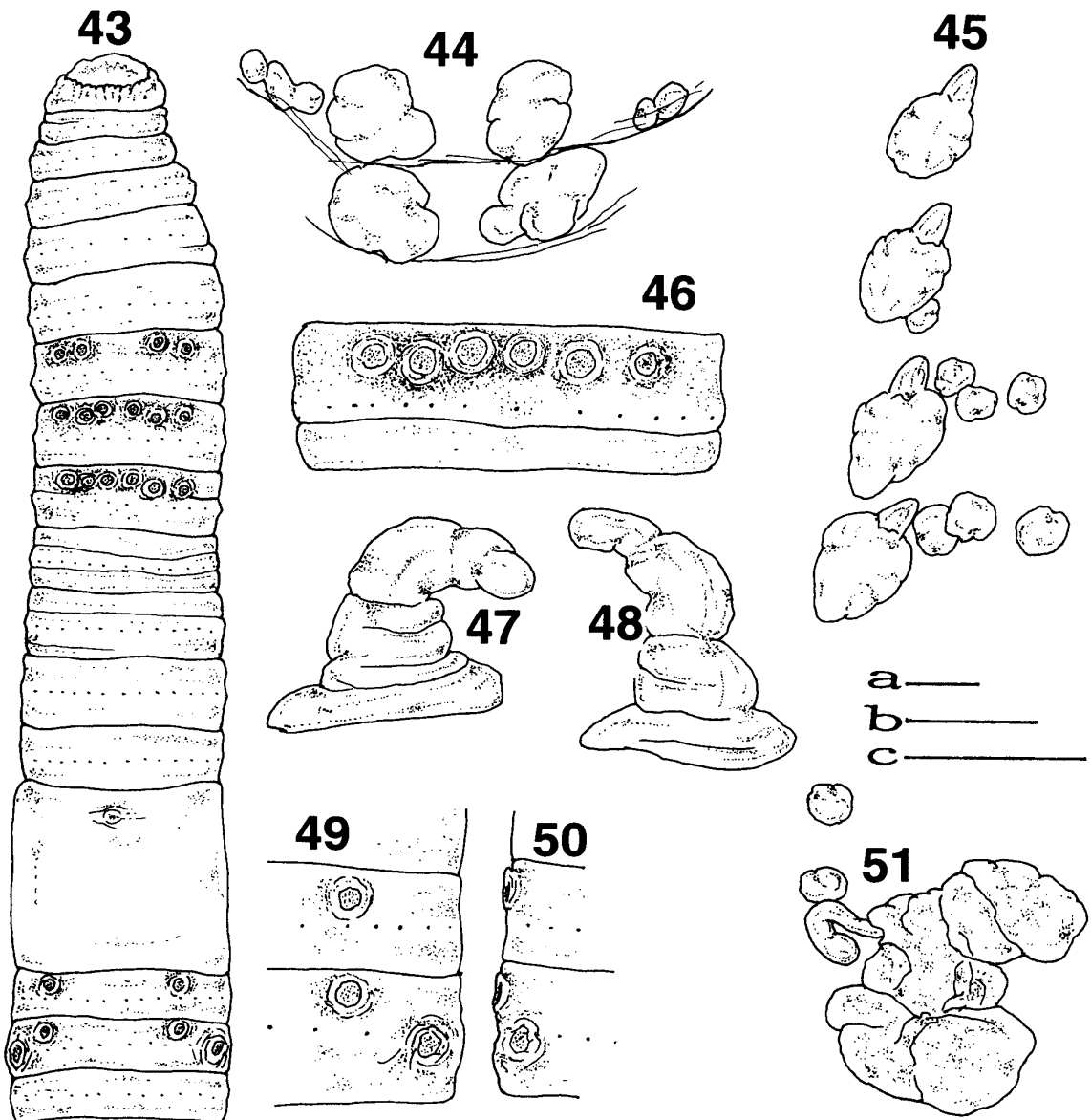
***Pheretima invisa* sp. nov.**

[New Japanese name: Kotsubu-mimizu]
(Figs. 52–59, Table 1)

Description. Body. Length 80–125 mm, width 3.1–4.5 mm. Number of segments 85–110. Light greenish yellow brown dorsally, light yellowish brown ventrally.

External characters. Four pairs of spermathecal pores, situated in furrows 5/6/7/8/9 in ventro-lateral sides, separated by a distance of ca. $1/3$ body circumference. Genital markings small, paired, circular sucker-shape; preclitellar slightly median to the line of the spermathecal pores, presetal on segment VIII and occasionally VII; occasionally, postclitellar closely associated with the male pores, postsetal on segment XVIII. Male pores simple, on medium-sized porophores, superficial on segment XVIII, separated by a distance of ca. $1/3$ body circumference. Female pore single, mid-ventrally on segment XIV. First dorsal pore beginning in furrow 11/12. Clitellum including segments XIV–XVI. Setal number 38–46 in segment VII, 56–64 in segment XX.

Internal characters. Simple intestinal caeca, paired, originating in segment XXVII, extending anteriorly for 4–5 segments. Intestine begins in XV. Genital



Figs. 43–51. *Pheretima umbrosa* sp. nov. Holotype (NSMT-An 324). 43: Ventral view of anterior body. 44: Spermathecae. 45–46: Intestinal caecum. 47: Testes. 48: Dorsal view of seminal vesicles. 49: Prostate gland. 50: Lateral view of segments XVI–XXIII. (Scale bars. a: 1 mm for 43, b: 1 mm for 44, 51, c: 1 mm for 45–50.)

glands, paired, glandular masses, on segment XIX without genital marking and occasionally on segment VIII. Septa absent in 8/9/10, thickened in 5/6/7/8 and 10/11/12/13/14. Four pairs of spermathecae large in segments VI–IX; ampulla consisting of a shovel-shaped pouch and a thick duct; diverticulum consisting of a oval pouch and a duct. Seminal vesicle small, extending to the dorsal line in segments XI–XII. Prostata ducts corresponding to male pores.

Material examined. Holotype (NSMT-An 326) and 5 paratypes (NSMT-An 327): Ohtanba Valley, 18–X–1986, from soil under a mixed forest of evergreen and deciduous trees. Other specimens examined: 3 exs. with same data as the type series.

Remarks. The new species resembles *Pheretima heteropoda* (Goto et Hatai, 1898) but is distinguishable from the latter species by very small genital markings.

***Pheretima monticola* sp. nov.**

[New Japanese name: Sanroku-mimizu]

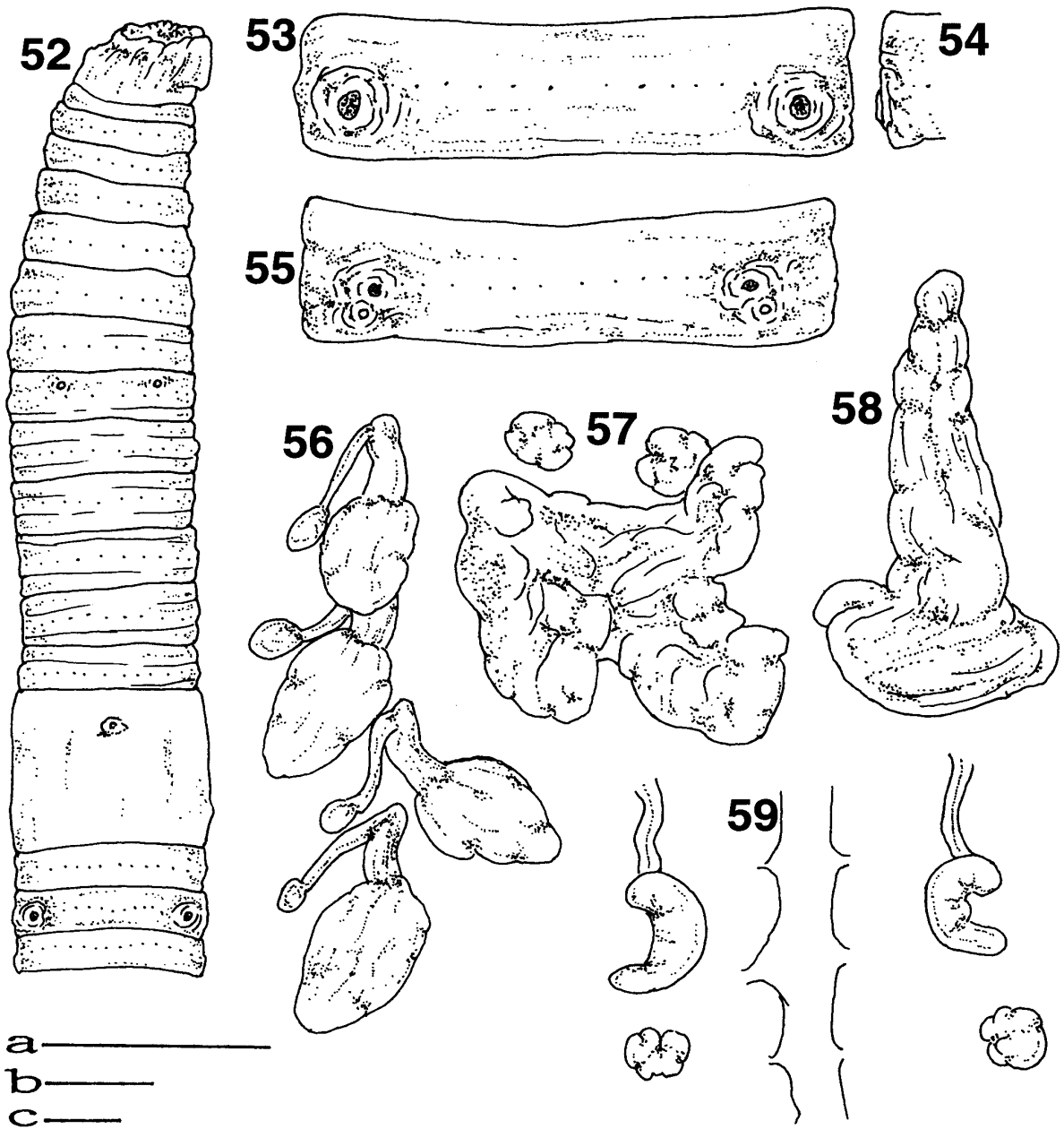
(Figs. 60–66, Table 1)

Description. Body. Length 70–105 mm, width 3.0–4.0 mm. Number of segments 90–98. Reddish brown dorsally, yellowish grey ventrally.

External characters. Four pairs of spermathecal pores situated in furrows 5/6/7/8/9 in ventro-lateral sides, separated by a distance of ca. 1/3 body circumference. Genital markings paired, circular sucker-shape; preclitellar median to the line spermathecal pores, preseatal on segments VIII–X, variable in the number and situation: postclitellar median to the line of the male pores, setal on segment XVII, occasionally XVI and XVIII, variable in the number and situation. Male pores simple, on medium-sized porophores, superficial on segment XVIII, separated by a distance of ca. 1/3 body circumference. Female pore single, mid-ventrally on segment XIV. First dorsal pore beginning in furrow 11/12, occasionally in furrow 12/13. Clitellum including segments XIV–XVI. Setal number 30–34 in segment VII, 33–50 in segment XX.

Internal characters. Simple intestinal caeca, paired, originating in segment XXVII, extending anteriorly to segments 4–5. Intestine begins in XV. Genital glands, paired, glandular masses, in segments VI–IX, associated with genital markings restricted to body wall. Septa absent in 8/9/10, slightly thickened in 5/6/7/8, thickened in 10/11/12/13/14. Four pairs of spermathecae in segments VI–IX; ampulla consisting of a shovel-shaped pouch and a thick duct; diverticulum consisting of a oval pouch and a duct. Seminal vesicles, extending to the dorsal line in segments XI–XII. Prostata extending through segments XVII–XIX or XVIII–XIX, ducts corresponding to the male pores.

Material examined. Holotype (NSMT-An 328) and 5 paratypes (NSMT-An 329): Itsukaichi City, 18–I–1987, K. Ishizuka, from soil under a mixed forest of ever-



Figs. 52–59. *Pheretima invisa* sp. nov. 52–54, 56–59: Holotype (NSMT-An 326). 55: Palatype (NSMT-An 327). 52: Ventral view of anterior body. 53: Male pore on segment XVIII. 54: Lateral view of segment XVIII. 55: Male pores and genital markings on segment XVIII. 56: Spermathecae. 57: Dorsal view of testes and seminal vesicles. 58: Intestinal caecum. 59: Prostate duct and glandular masses. (scale bars. a: 5 mm for 52, b: 1 mm for 53–56, 59, c: 1 mm for 57–58.)

Table 1. Characters of the eight related species with four pairs of spermathecal pores of the genus *Pheretima*.

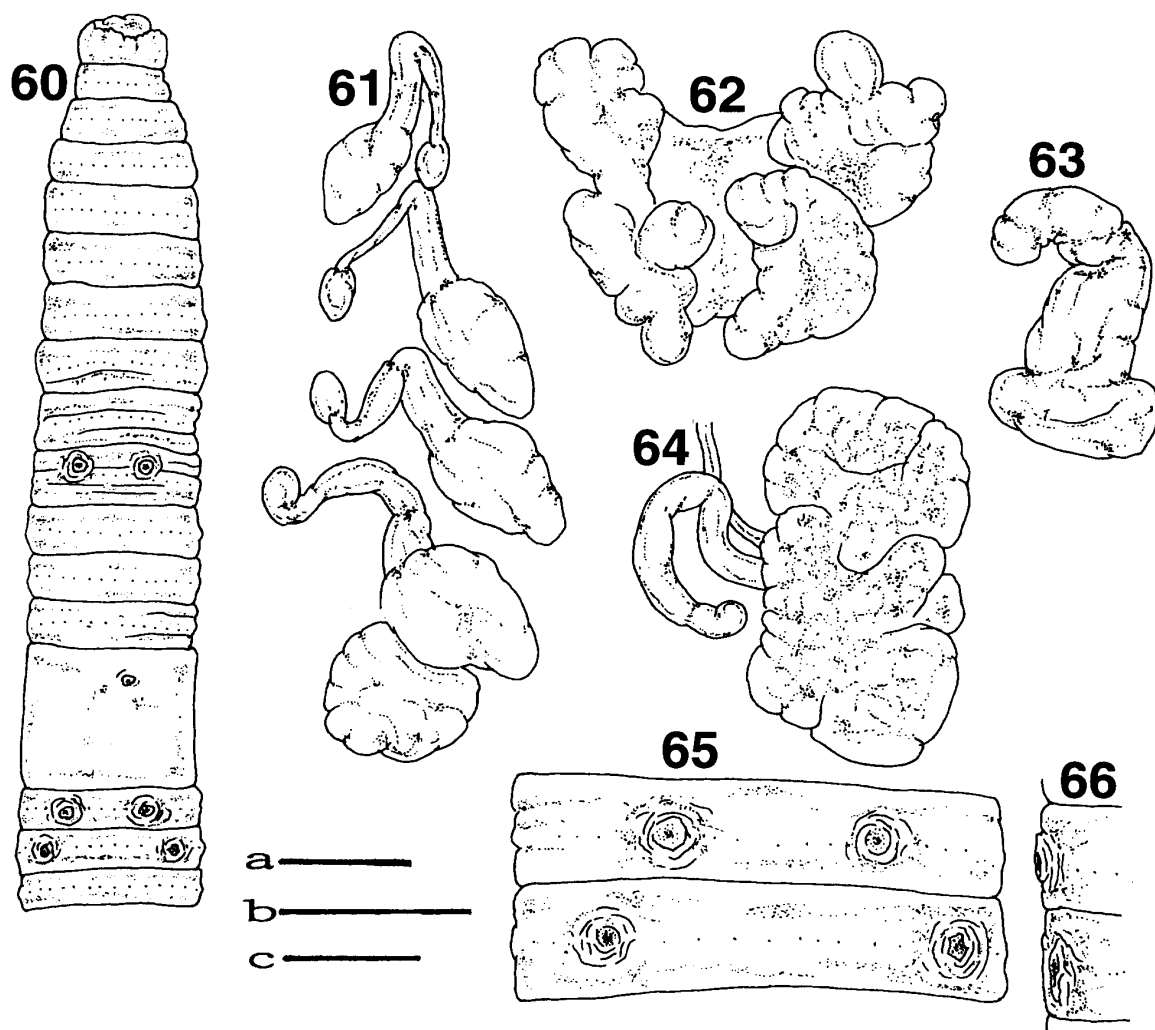
	Intestinal caeca	Genital markings		Body length	Dorsal coloration
		Preclitellar	Postclitellar		
<i>Ph. heteropoda</i> (Goto et Hatai)	Simple	Presetal on segments VI–IX	Absent	90–220 mm	Greenish brown
<i>Ph. divergens</i> (Michaelsen)	Serrate	Presetal on segments VI–IX	Presetal on segment XVIII	90–220 mm	Brown
<i>Ph. mutabilis</i> sp. nov.	Simple	Pre- and postsetal on segments VI–IX	Presetal on segments XVII–XX	80–110 mm	Reddish brown
<i>Ph. nubicola</i> sp. nov.	Simple	Postsetal on segments V–VIII	Presetal on segments XVII–XVIII	70–130 mm	Reddish brown
<i>Ph. hinoharensis</i> sp. nov.	Simple	Postsetal on segments V–VIII	Presetal on segments XVIII–XIX	60–85 mm	Light brown
<i>Ph. umbrosa</i> sp. nov.	Simple	Presetal on segments VI–IX	Presetal on segments XVII–XIX	80–105 mm	Light brown
<i>Ph. invisa</i> sp. nov.	Simple	Presetal on segment VIII	Absent occasionally present	80–125 mm	Light greenish brown
<i>Ph. monticola</i> sp. nov.	Simple	Presetal on segments VIII–X	Setal on XVII occasionally XVI, XVIII	70–105 mm	Reddish brown

green and deciduous trees. Other specimens examined: 8 exs. with same data as the Holotype. 4 exs. Nippara Valley, 22-X-1998. 1 ex. Hikawa, 27-X-1998. All the specimens were collected by the authors.

Remarks. The new species resembles *Pheretima heteropoda* (Goto et Hatai, 1898), but is distinguishable from the latter species by the paired genital markings, on segment X and XVII.

Key to the species of the genus *Pheretima* s. lat. with Simple Intestinal Caeca

1. Spermathecal pores absent *Ph. imperfecta* sp. nov.
- Spermathecal pores two pairs 2
- Spermathecal pores three pairs 3
- Spermathecal pores four pairs 7
- Spermathecal pores five pairs *Ph. quintana* sp. nov.
2. Genital marking present *Ph. tamaensis* sp. nov.
- Genital marking absent *Ph. hiberna* sp. nov.
3. Genital marking present 4
- Genital marking absent 5
4. Light brown dorsal *Ph. hypogaea* sp. nov.
- Greenish brown dorsal *Ph. hupeiensis* (Michaelsen)



Figs. 60–66. *Pheretima monticola* sp. nov. Holotype (NSMT-An 328). 60: Ventral view of anterior body. 61: Spermathecae and glandular masses. 62: Dorsal view of seminal vesicles. 63: Prostate gland with duct. 64: Intestinal caecum. 65: Male pores on segment XVIII and genital markings on segment XIX. 66: Lateral view of segments XVIII–XIX. (Scale bars. a: 2 mm for 60, b: 1 mm for 61–62, 65–66, c: 1 mm for 63–64.)

- 5. Diverticulum absent *Ph. stipata* sp. nov.
- Diverticulum present 6
- 6. Diverticulum consisting of a duct and a terminal oval *Ph. elliptica* sp. nov.
- Diverticulum slender tubular *Ph. phaselus* (Goto et Hatai)
- 7. Genital marking absent 8
- Genital marking present 12
- 8. First dorsal pore 11/12 *Ph. rufidula* sp. nov.
- First dorsal pore 12/13 9
- 9. Male pore, large-sized porophores *Ph. subrotunda* sp. nov.

- Male pore, medium-sized porophores. 10
- 10. Diverticulum absent *Ph. semilunaris* sp. nov.
- Diverticulum present. 11
- 11. Long diverticulum. *Ph. flavida* sp. nov.
- Short diverticulum. *Ph. silvestris* sp. nov.
- 12. Presence of genital markings, preclitellar. 3
- Presence of genital markings, postclitellar 16
- Presence of genital markings, pre- and postclitellar 20
- 13. Genital markings presetal on segments. *Ph. heteropoda* (Goto et Hatai)
- Genital markings possetal on segments 14
- 14. Diverticulum absent. *Ph. fulva* sp. nov.
- Diverticulum present. 15
- 15. Genital glands present *Ph. subalpina* sp. nov.
- Genital glands absent *Ph. subterranea* sp. nov.
- 16. Genital markings presetal on segments. 17
- Genital markings possetal on segments 18
- 17. Genital markings contact with male pores *Ph. octo* sp. nov.
- Genital markings separation with male pores *Ph. micronaria* (Goto et Hatai)
- 18. Presence of genital markings on segments XVIII . . . *Ph. carnosa* (Goto et Hatai)
- Absence of genital markings on segments XVIII 19
- 19. Light whitish brown dorsal *Ph. lactea* sp. nov.
- Light brown dorsal *Ph. mitakensis* sp. nov.
- 20. External marking present. *Ph. conformis* sp. nov.
- External marking absent 21
- 21. Diverticulum absent. *Ph. umbrosa* sp. nov.
- Diverticulum present. 22
- 22. Genital markings, close to median line. *Ph. disticha* sp. nov.
- Genital markings, slightly median line 23
- 23. small sized genital markings *Ph. invisa* sp. nov.
- medium-sized genital markings 24
- 24. Genital markings, preclitellar, presetal on segments. 25
- Genital markings, prstclitellar, possetal on segments 26
- 25. Genital markings, postclitellar, presetal on segment *Ph. mutabilis* sp. nov.
- Genital markings, postclitellar, setal on segments. *Ph. monticola* sp. nov.
- 26. Genital markings on segments XVII–XVIII *Ph. nubicola* sp. nov.
- Genital markings on segments XVIII–XIX *Ph. hinoharaensis* sp. nov.

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References

- Adachi, T., 1955. Note on the terrestrial earthworms collected at the Tokyo Agricultural University Farm. *J. Agr. Sci., Tokyo Nogyo Univ.*, **2**: 537–561.
- Chen, Y., 1938. Oligochaeta from Hainan, Kwangtung. *Contr. Biol. Lab. Sci. Soc. China*, **12**: 357–427.
- Chen, Y., 1946. On the terrestrial Oligochaeta from Szechuan III. *J. W. China Res. Soc.*, **16**: 83–141.
- Goto, S. & S. Hatai, 1898. New or imperfectly known species of earthworms. No. 1. *Annot. Zool. Japon.*, **2**: 65–78.
- Ishizuka, K., 1999 a. New species of the genus *Pheretima* s. lat. (Annelida, Oligochaeta, Megascolecidae) from Tokyo, Japan—Species with Maniccate intestinal caeca. *Bull. Natn. Sci. Mus., Tokyo*, Ser. A, **25**: 33–57.
- Ishizuka, K., 1999 b. New species of the genus *Pheretima* s. lat. (Annelida, Oligochaeta, Megascolecidae) from Tokyo, Japan—Part II. Species with serrate intestinal caeca. *Bull. Natn. Sci. Mus., Tokyo*, Ser. A, **25**: 101–122.
- Ishizuka, K., 1999 c. New species of the genus *Pheretima* s. lat. (Annelida, Oligochaeta, Megascolecidae) from Tokyo, Japan—Part III. Species with simple intestinal caeca (1). *Bull. Natn. Sci. Mus., Tokyo*, Ser. A, **25**: 299–242.
- Ishizuka, K., 2000. New species of the genus *Pheretima* s. lat. (Annelida, Oligochaeta, Megascolecidae) from Tokyo, Japan—Part IV. Species with simple intestinal caeca (2). *Bull. Natn. Sci. Mus., Tokyo*, Ser. A, **26**: 13–33.
- Michaelsen, W., 1892. Terricolen der Berliner Zoologischen Sammlung. II. *Arch. Naturg.*, **58**: 209–261.
- Ohfuchi, S., 1937. On the species possessing four pairs of spermathecae in the genus *Pheretima*. together with the variability of some external and internal characters. *Res. Bull. Saito Ho-on Kai Mus.*, **12**: 31–136.
- Yamaguchi, H., 1962 a. On the terrestrial earthworms from Hokkaido. *Seibutu Kyozaikaihatu*, (2): 16–35. (In Japanese.)
- Yamaguchi, H., 1962 b. On earthworms belonging to the genus *Pheretima* collected from the southern part of Hokkaido. *J. Hokkaido Gakugei Univ.*, **13**: 1–21.